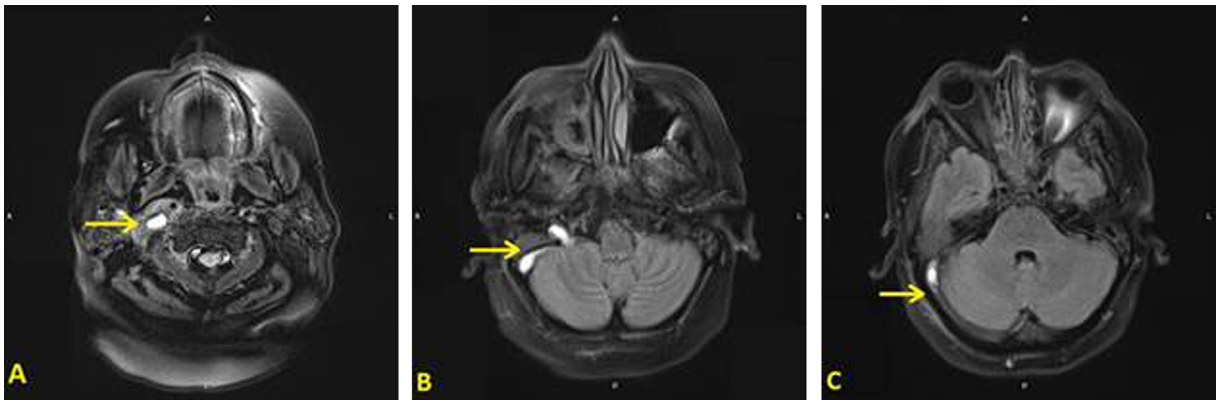


**Figure 1.** MRI/MRV head and brain with sinus thrombosis involving the right internal jugular vein (A), sigmoid sinus (B) and entire right transverse sigmoid sinus (C).

images of chest and abdomen showed no additional clot extension and specifically, no clot on the central venous catheter. Patient was started on anticoagulation after which her mentation improved gradually over several weeks. Follow up MRI/MRV after two weeks of anticoagulation showed persistence of the dural clot, but no extension. The patient was discharged to the outpatient environment with continued thrombosis on prolonged therapy and is currently D+145 from transplant.

Patients undergoing stem cell transplantation (SCT) have known risk factors for the development of VTE including the underlying malignancy, chemotherapy regimens, immobility during hospitalization and the use of central venous catheters. CVST is an unusual complication following SCT and was heralded in this case by both dramatic clinical features and subtle findings on imaging. It is unclear if CVST is extremely rare or under-diagnosed post-transplant, and is a possible element in the differential diagnosis of confusion in this setting. Once detected, the dural thrombus persisted despite prolonged anti-coagulation and steady improvement of patient's sentinel symptoms.

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### Absolute Lymphocyte Count (ALC) Recovery in Multiple Myeloma (MM) Patients after Autologous Stem Cell Transplant (ASCT) Is Related to CD34+ Dose-Infused

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**Background:** Preliminary data presented by our group at the 2014 ASBMT meeting suggested a correlation between higher CD34+ Cell-Dose Infused (CD34-CDI) during ASCT and shorter time to ALC recovery for MM patients (pts). This updated analysis which includes additional pts with longer follow-up supports our prior results, and suggests a correlation between higher CD34-CDI and decreased incidence of infections.
**Methods:** From 1/2012-1/2014, 21 consecutive MM pts who had undergone ASCT were evaluated retrospectively to determine the impact of CD34-CDI on ALCs and infectious events. During the first 100 days post-ASCT, all infectious complications were noted and ALCs collected. Overall survival and progression free survival were monitored. ALC recovery was defined as the first day of three consecutive measurements for the cutoff values: ALC $\geq$ 800, ALC $\geq$ 1000, and ALC $\geq$ 1500. Cox proportional hazard models were applied to evaluate the association of CD34-CDI to ALC recovery. The significance of the association was assessed using the Log Rank Test since no competing risks were identified. Additionally, the Nonparametric Wilcoxon Rank Sum Test was used to determine the relationship between CD34-CDI and the development of any infectious events.
**Results:** Of the 21 patients, 81% were male, 19% were female. Median age was 62 years (range 45-71). Majority (62%) had IgG MM and kappa light chain restriction (86%). Approximately 62% had ISS Stage II/III disease. Patients who had received a higher CD34-CDI were more likely to achieve ALC $\geq$ 800 (p=0.040) and ALC $\geq$ 1000 (p=0.021). For ALC recovery defined as ALC $\geq$ 1500, no statistical significance was observed (p=0.27). When CD34-CDI was $< 4x10^6$ cells/kg, median times to ALC $\geq$ 800 and ALC $\geq$ 1000 were 33.5 and 41.5 days respectively, and were 19 and 22 days when CD34-CDI was $> 4x10^6$ cells/kg. Pts without infections tended to have higher CD34-CDI compared to those pts with infections (p=0.0452). Five of six pts with CD34-CDI $< 4x10^6$ cells/kg, and three of 15 pts with CD34-CDI $> 4x10^6$ cells/kg developed at least one bacterial infectious complication. Among pts who received CD34-CDI $< 4x10^6$ cells/kg, 60% of infections (9 out of 15 events) occurred. With 17 months (mo) of median follow-up (range 9-30 mo), five pts have relapsed and one death has occurred. Four of five relapses, and the one death received CD34-CDI $> 4x10^6$ cells/kg.
**Conclusion:** Higher CD34-CDI ($> 4x10^6$ cells/kg) may shorten time to ALC recovery and limit infectious complications. Most relapses to date occurred in pts transplanted with CD34-CDI $> 4x10^6$ cells/kg, raising the question of product contamination with higher cell-doses. Additional follow-up and larger prospective trials are needed to further define optimal CD34-CDI that balances the benefits of shortened time to ALC recovery, minimizing infectious complications, and decreasing risk of product contamination.

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### In Vivo Purging May Not be Required in the Era of Universal Use of Rituximab Containing Chemo-Immunotherapy in Patients with Follicular and Mantle Cell Lymphoma: A Single Center Experience

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**Introduction:** Although rituximab containing chemotherapy regimens have improved response rates in B-cell lymphomas, a significant percentage of patients will eventually relapse. Autologous stem cell transplantation (Auto SCT) may provide long-term remission in some of these patients. Tumor contamination of harvested stem cell graft has been postulated as a reason for relapse after Auto SCT. Single agent rituximab has been used for in-vivo purging of CD20+ tumor cells with positive results. In this study, we aimed to evaluate whether use of rituximab based in-vivo purging is still beneficial in the era of universal use of rituximab containing chemotherapy in patients with follicular (FL) or mantle cell lymphoma (MCL).

**Materials and Methods:** Twenty consecutive patients with a diagnosis of relapsed CD20+ FL or transplant eligible MCL were included in this study. All patients received rituximab containing chemotherapy. Restaging was done after completion of chemotherapy and those with chemo-sensitive disease (n=14) were considered for Auto SCT. Polymerase Chain Reaction (PCR) analysis for bcl2 and bcl1 were done on apheresis products from patients with FL and MCL respectively. In-vivo purging with single agent rituximab was planned if any stem cell product were to be found PCR positive prior to Auto SCT.

**Results:** A total of 19 patients were eligible for analysis. Patient characteristics are shown in the accompanying table. The bcl-2/bcl-1 status of the graft was available in 14 patients (FL; n=10 and MCL; n=4). The stem cell products in all 14 patients tested negative by PCR for both bcl2 (FL) and bcl1(MCL). None of these patients required additional rituximab treatment for in-vivo purging. Eleven patients (FL; n=7 and MCL; n=4) underwent Auto SCT. Three patients with FL opted for "Harvest and Hold" approach and delayed transplantation. Median (range) PFS and OS of patients with FL undergoing Auto SCT were 2 yrs. (9 mo-5 y) and 3 yrs. (2-5 y) and those with MCL were 3 yrs. (2-4y) and 4 yrs. (2-5 y) respectively (median duration of follow up-3yrs.).

**Discussion:** In this small cohort of patients with FL and MCL treated by R-chemotherapy, 100% of the harvested stem cell products were tumor free by PCR analysis. Our findings suggest that with universal use of rituximab containing chemo-immunotherapy in patients with FL and MCL, additional in-vivo purging may not be required. We may also conclude that persistence of residual/refractory disease after auto SCT rather than tumor contamination of the graft was the most likely cause of relapse in this cohort.

**Table 1**
Patient Characteristics

| Patient characteristics | |
|---|---|
| Age (median and range) | 59 y (41-64) |
| Sex (M:F) | 17:2 |
| Diagnosis (n) | |
| Follicular lymphoma | 15 |
| Mantle cell lymphoma | 4 |
| Chemotherapy (n) | |
| RICE | 7 |
| R-HyperCVAD | 3 |
| R-Bendamustine | 5 |
| R-CHOP | 4 |
| Status at transplantation (n) | |
| CR1 | 4 |
| CR2 | 3 |
| >CR2 | 2 |
| PR (Chemo sensitive) | 2 |

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### The Addition of Meloxicam to G-CSF Is Associated with Good Mobilization Rates, Faster Engraftment and Reduced Toxicity and Hospital Stay after Autologous Stem Cell Transplantation—a Phase II Study

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Mobilization failure is seen in 10-15% of patients undergoing G-CSF or chemo mobilization and the use of plerixafor is limited by its cost in developing countries. This phase II study is being undertaken to study whether the addition of Meloxicam to standard G-CSF will improve rates of mobilization (CTRI/2014/06/004671). Patients received Meloxicam 15 mg once daily for 5 days from Day -7 to -3 and G-CSF 5 μg/kg BD from Day -4 to -1. Target CD34 dose was 4 x $10^6$ CD34/Kg. Patients with myeloma proceeded immediately to an autologous transplant (auto SCT) with single agent melphalan conditioning while patients with lymphoma and AML had cryopreservation of harvest followed by using either BEAM or BuCy2 conditioning.

Between November 2013 and July 2014, 25 patients (20 males and 5 females) with a median age of 51 years (range: 25-63) received meloxicam with G-CSF. There was no toxicity in any of the patients during the 5 days of administration of meloxicam. A cell dose of $>$ 2 x $10^6$ CD34/kg was achieved in 21 (84%) with a cell dose of $>$ 3 x $10^6$ CD34/kg being achieved in a single harvest in 15 (60%). Four patients needed additional cyclophosphamide mobilization to achieve the target cell doses. Analysis of peripheral blood CD34 counts revealed that 20 (80%) had counts $>$ 20/ul on

**Table 1**
Comparison of Demographic Data, Mobilization Characteristics and Post Transplant Outcome in Patients Using Meloxicam + G-CSF Compared with Historical Controls

| Variables | Meloxicam + GCSF (n = 25) | G-CSF Alone (n = 50) | *P* Value |
|---|---|---|---|
| Median age (yr) | 51 (25-63) | 50 (18-65) | .902 |
| Sex M:F | 20:5 | 36:14 | .577 |
| Diagnosis | | | |
| MM | 15 (60%) | 32 (64%) | |
| NHL/HD | 8 (32%) | 14 (28%) | |
| APML/AML | 2 (8%) | 4 (8%) | |
| Successful mobilization (>2 × $10^6$ CD34/kg after 2 harvests) | 21 (84%) | 42 (84%) | 1.000 |
| CD34 > 5 × $10^6$/kg | 12 (48%) | 18 (36%) | .138 |
| CD34 > 3 × $10^6$/kg | 20 (80%) | 32 (64%) | .191 |
| Conditioning regimen | | | |
| High dose melphalan | 15 (60%) | 32 (64%) | |
| BEAM | 8 (32%) | 14 (28%) | |
| Bu/Cy2 | 2 (8%) | 4 (8%) | |
| ANC > 500/cumm (d) | 11.09 ± 0.53 | 11.53 ± 0.92 | .044 |
| ANC > 1000/cumm (d) | 11.61 ± 0.45 | 11.95 ± 0.99 | .216 |
| Platelet count > 20000/cumm (d) | 14.7 ± 4.5 | 16.4 ± 6.3 | .291 |
| Platelet count > 50000/cumm (d) | 17.4 ± 7.5 | 24.7 ± 19.3 | .143 |
| Platelet count > 100000/cumm (d) | 23.1 ± 11.9 | 51.2 ± 58.2 | .025 |
| Number of red cell units transfused | 1.19 ± 1.1 | 2.31 ± 2.45 | .031 |
| Number of platelet units transfused | 12 ± 9.1 | 17 ± 16 | .327 |
| No of pts with grade III-IV toxicity | 7/21 (31.8%) | 33/47 (59.5%) | .040 |
| Duration of hospital stay from day 0 (d) | 16 ± 3.3 | 20 ± 7.3 | .025 |